

Sequence Listing

<110> Schulze, Renate
 Lorenz, Patrick
 Eck, Jurgen
 May, Oliver
 Groger, Harald
 Trauthwein, Harald

<120> Novel Alcohol Dehydrogenases

<130> 7601/88256

<140> 11/593,119

<141> 2006-09-18

<160> 68

<170> PatentIn version 3.1

<210> 1

<211> 162

<212> PRT

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<223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
 ZF0050197= Pseudomonas oleovorans; ZF0050294= Rhodococcus;
 ZF0050330= Bacillus; ZF0051303= Bacterium; ZF0051337= Methylobionas;
 ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;

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<223> ZF0050544= Phyllobacterium rubiacearum; ZF0002852= Rhodococcus;
 ZF0050310= Arthrobacter paraffineus; ZF0002862= Streptomyces
 clavuligerus; ZF0050292= Bacterium; ZF0002031= Streptomyces;
 ZF0002349= Streptomyces spectabilis; ZF0002434= Streptomyces;

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<223> ZF0002437= Streptomyces; ZF0003712= Micromonospora; ZF0003765=
 Streptomyces; ZF0051305= Bacterium; ZF0003513= Actinomyces;
 ZF0050993= Kocuria; ZF0002018= Streptomyces; ZF0003767= Actinomyces;
 ZF0002332= Streptomyces diastatochromogenes; ZF0003768= Actinomyces;
 ZF0002379=

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<223> Streptomyces coelestis; ZF0002351= Nonomuraea roseoviolacea;
 ZF0003769= Actinomyces;

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Asn Tyr Cys Ser Arg Ala Gln Glu Leu Gly Ile Asn Pro Pro Gly Leu
20 25 30

Gly Ala Pro Gly Ala Leu Ala Glu Phe Met Ile Val Asp Ser Pro Arg
35 40 45

His Leu Val Pro Ile Gly Asp Leu Asp Pro Val Lys Thr Val Pro Leu
50 55 60

Thr Asp Ala Gly Leu Thr Pro Tyr His Ala Ile Lys Arg Ser Leu Pro
65 70 75 80

Lys Leu Arg Gly Gly Ser Tyr Ala Val Val Ile Gly Thr Gly Gly Leu
85 90 95

Gly His Val Ala Ile Gln Leu Leu Arg His Leu Ser Ala Ser Thr Val
100 105 110

Ile Ala Leu Asp Val Ser Ala Asp Lys Leu Glu Leu Ala Thr Lys Val
115 120 125

Gly Ala His Glu Val Val Leu Ser Asp Lys Asp Ala Ala Glu Asn Val
130 135 140

Arg Lys Ile Thr Gly Ser Gln Gly Ala Ala Leu Val Leu Asp Phe Val
145 150 155 160

Gly Tyr

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<213> unknown

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ZF0050197= Pseudomonas oleovorans; ZF0050294= Rhodococcus;
ZF0050330= Bacillus; ZF0051303= Bacterium; ZF0051337= Methylobacter;
ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;

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clavuligerus; ZF0050292= Bacterium; ZF0002031= Streptomyces;
ZF0002349= Streptomyces spectabilis; ZF0002434= Streptomyces;

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Asn Tyr Cys Ser Arg Ala Gln Glu Leu Gly Ile Asn Pro Pro Gly Leu
20 25 30

Gly Ala Pro Gly Ala Leu Ala Glu Phe Met Ile Val Asp Ser Pro Arg
35 40 45

His Leu Val Pro Ile Gly Asp Leu Asp Pro Val Lys Thr Val Pro Leu
50 55 60

Thr Asp Ala Gly Leu Thr Pro Tyr His Ala Ile Lys Arg Ser Leu Pro
65 70 75 80

Lys Leu Arg Gly Gly Ser Tyr Ala Val Val Ile Gly Thr Gly Gly Leu
85 90 95

Gly His Val Thr Ile Gln Leu Leu Arg His Leu Ser Ala Ala Thr Val
100 105 110

Ile Ala Leu Asp Val Ser Ala Asp Lys Leu Glu Leu Ala Thr Lys Val
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<210> 3

<211> 162

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Asn Tyr Cys Ser Arg Ala Arg Glu Leu Gly Ile Ala Pro Pro Gly Leu
20 25 30

Gly Ala Pro Gly Ala Ile Ala Glu Tyr Met Ile Val Asp Ser Pro Arg
35 40 45

His Leu Val Pro Ile Gly Asp Leu Asp Pro Val Thr Thr Val Pro Leu
50 55 60

Thr Asp Ala Gly Leu Thr Pro Tyr His Ala Ile Lys Arg Ser Leu Gly
65 70 75 80

Lys Leu Arg Ala Gly Ser Tyr Ala Val Val Ile Gly Thr Gly Gly Leu
85 90 95

Gly His Val Gly Ile Gln Leu Leu Arg His Leu Ser Pro Ala Arg Ile
100 105 110

Ile Ala Leu Asp Val Asn Asp Glu Lys Leu Ala Phe Ala Arg Glu Val
115 120 125

Gly Ala His Glu Thr Val Leu Ser Asn Ala Asp Ala Ala Ala Asn Val
130 135 140

Arg Lys Ile Thr Gly Ser Ala Gly Ala Ala Leu Val Leu Asp Phe Val
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Gly Tyr

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<213> unknown

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Asn Tyr Cys Ser Arg Ala Lys Glu Leu Gly Ile Asn Pro Pro Gly Leu
20 25 30

Gly Ala Pro Gly Ala Leu Ala Glu Phe Met Ile Val Asp Ser Pro Arg
35 40 45

His Leu Val Pro Ile Gly Asp Leu Asp Pro Val Lys Thr Val Pro Leu
50 55 60

Thr Asp Ala Gly Leu Thr Pro Tyr His Ala Ile Lys Arg Ser Leu Pro
65 70 75 80

Lys Leu Arg Gly Gly Ala Tyr Ala Val Val Ile Gly Thr Gly Gly Leu
85 90 95

Gly His Val Ala Ile Gln Leu Leu Arg His Leu Ser Ala Ala Thr Val
100 105 110

Ile Ala Leu Asp Val Ser Ala Asp Lys Leu Val Leu Ala Thr Lys Val
115 120 125

Gly Ala His Glu Val Val Leu Ser Asp Lys Asp Ala Ala Glu Asn Val
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Arg Arg Ile Thr Gly Ser Gln Gly Ala Ala Leu Val Leu Asp Phe Val
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<211> 70

<212> PRT

<213> unknown

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ZF0003868= Actinomadura; ZF0004213= Actinomyces; ZF0003876=
Actinomyces; ZF0003866= Actinomyces; ZF0003864= Actinomyces;

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<223> ZF0003862= Actinomadura; ZF0003869= Actinomyces; ZF0003867=
Actinomadura; ZF0004216= Actinomyces; ZF0004235= Actinomyces;
ZF0004209= Actinomadura; ZF0004214= Actinomyces; ZF0003871=
Actinomyces; ZF0004063= Actinomadura; ZF0004052= Actinomadura;

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<223> ZF0006405= Streptomyces; ZF0003865= Actinomadura; ZF0004047= Actinomadura; ZF0004070= Actinomyces; ZF0004085= Actinomyces; ZF0004217= Actinomyces; ZF0004089= Actinomadura; ZF0004090= Actinomadura; ZF0006138= Streptomyces; ZF0004236= Actinomadura;

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<223> ZF0051203= Bacterium;

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Asn Tyr Cys Leu Arg Ala Lys Glu Leu Gly Ile Ala Pro Pro Gly Leu
20 25 30

Gly Ser Pro Gly Ala Met Ala Glu Tyr Met Ile Val Asp Asp Pro Arg
35 40 45

His Leu Val Pro Leu Gly Gly Leu Asp Pro Val Gln Ala Val Pro Leu
50 55 60

Thr Asp Ala Gly Leu Thr
65 70

<210> 6

<211> 94

<212> PRT

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<223> ZF0002018= Streptomyces; ZF0003767= Actinomyces; ZF0003764= Streptomyces; ZF0002331= Actinoplanes philippinensis; ZF0002441= Streptomyces; ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240= Bacterium; ZF0002333= Rhodococcus erythropolis;

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<223> ZF0003713= Micromonospora; ZF0004980= Streptomyces; ZF0004821= Actinomyces; ZF0002359= Actinoplanes ianthinogenes; ZF0002396=

Actinoplanes; ZF0003781= Actinomyces; ZF0003512= Actinomyces;
ZF0006093= Streptomyces; ZF0006103= Streptomyces;

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<223> ZF0006087= Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium;
ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538=
Actinomyces; ZF0003535= Actinomyces;

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Cys His Thr Asp His His Ile Val Thr Gly Ala Thr Pro Met Pro Ser
1 5 10 15

Phe Pro Val Met Gly Gly His Glu Gly Ser Gly Val Ile Thr Lys Leu
20 25 30

Gly Pro Glu Val Lys Gly Leu Glu Val Gly Asp His Val Val Leu Ser
35 40 45

Phe Ile Pro Ala Cys Gly Thr Cys Pro Ala Cys Ser Ala Gly His Gln
50 55 60

Asn Leu Cys Asp Leu Gly Met Gly Leu Leu Ser Gly Gln Ala Ile Ser
65 70 75 80

Asp Gly Thr Tyr Arg Ile Gln Ala Arg Gly Glu Asn Val Ile
85 90

<210> 7

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ZF0050544= Phyllobacterium rubiacearum; ZF0002031= Streptomyces;
ZF0002349= Streptomyces spectabilis; ZF0002434= Streptomyces;
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Bacterium; ZF0002333= Rhodococcus erythropolis;

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<223> ZF0006087= Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium; ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538= Actinomyces; ZF0003535= Actinomyces;

<400> 7

Cys His Thr Asp Asp His Ala Val Thr Gly Asp Leu Ala Val Pro Leu
1 5 10 15

Pro Val Ile Gly Gly His Glu Gly Ala Gly Ile Val Glu Lys Val Gly
20 25 30

Pro Gly Val Arg Asp Val Glu Val Gly Asp His Val Val Leu Ser Phe
35 40 45

Ile Pro Ser Cys Gly Arg Cys Arg Trp Cys Ala Val Gly Gln Ser Asn
50 55 60

Leu Cys Asp Leu Gly Ala Ile Leu Met Ala Gly Ala Gln Val Asp Gly
65 70 75 80

Thr Tyr Arg Ala Thr Ala Arg Gly His Asp Val Gly
85 90

<210> 8

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<212> PRT

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Cys His Thr Asp Asp His Ala Val Thr Gly Asp Leu Ala Val Pro Leu
1 5 10 15

Pro Val Ile Gly Gly His Glu Gly Ala Gly Ile Val Glu Lys Val Gly
20 25 30

Pro Gly Val Arg Asp Val Glu Val Gly Asp His Val Val Leu Ser Phe
35 40 45

Ile Pro Ser Cys Gly Arg Cys Arg Trp Cys Ala Val Gly Gln Ser Asn
50 55 60

Leu Cys Asp Leu Gly Ala Ile Leu Met Ala Gly Ala Gln Val Asp Gly
65 70 75 80

Thr Tyr Arg Ala Thr Ala Arg Gly His Asp Val Gly
85 90

<210> 9

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<212> PRT

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Streptomyces; ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240= Bacterium; ZF0002333= Rhodococcus erythropolis;

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Cys His Thr Asp Asp His Ala Val Thr Gly Asp Leu Ala Val Pro Leu
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Pro Val Ile Gly Gly His Glu Gly Ala Gly Ile Val Glu Lys Val Gly
20 25 30

Pro Gly Val Arg Asp Val Glu Val Gly Asp His Val Val Leu Ser Phe
35 40 45

Ile Pro Ser Cys Gly Arg Cys Arg Trp Cys Ala Val Gly Gln Ser Asn
50 55 60

Leu Cys Asp Leu Gly Ala Ile Leu Met Ala Gly Ala Gln Val Asp Gly
65 70 75 80

Thr Tyr Arg Ala Thr Ala Arg Gly His Asp Val Gly
85 90

<210> 10

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Pro	Val	Ile	Gly	Gly	His	Glu	Gly	Ala	Gly	Ile	Val	Glu	Lys	Val	Gly
			20					25					30		

Pro	Gly	Val	Arg	Asp	Val	Glu	Val	Gly	Asp	His	Val	Val	Leu	Ser	Phe
		35				40						45			

Ile	Pro	Ser	Cys	Gly	Arg	Cys	Arg	Trp	Cys	Ala	Val	Gly	Gln	Ser	Asn
	50					55					60				

Leu	Cys	Asp	Leu	Gly	Ala	Ile	Leu	Met	Ala	Gly	Ala	Arg	Val	Asp	Gly
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Thr	Tyr	Arg	Ala	Thr	Ala	Arg	Gly	His	Asp	Val	Gly
				85					90		

<210> 11

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Cys His Thr Asp Asp His Ala Val Thr Gly Asp Leu Ala Val Pro Leu
1 5 10 15

Pro Val Ile Gly Gly His Glu Gly Ala Gly Ile Val Glu Lys Val Gly
20 25 30

Pro Gly Val Arg Asp Val Glu Val Gly Asp His Val Val Leu Ser Phe
35 40 45

Ile Pro Ser Cys Gly Arg Cys Arg Trp Cys Ala Val Gly Gln Ser Asn
50 55 60

Leu Cys Asp Leu Gly Ala Ile Leu Met Ala Gly Ala Gln Val Asp Gly
65 70 75 80

Thr Tyr Arg Ala Thr Ala Arg Gly His Asp Val Gly
85 90

<210> 12

<211> 93

<212> PRT

<213> unknown

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<223> ZF0050310= Arthrobacter paraffineus

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1 5 10 15

Pro Cys Val Phe Gly His Glu Gly Ala Gly Val Val Glu Ala Val Gly
20 25 30

Ser Ser Ile Asp Ser Ile Ala Pro Gly Asp His Val Leu Leu Ser Tyr
35 40 45

Arg Ser Cys Gly Val Cys Arg Gln Cys Leu Ser Gly His Arg Ala Tyr
50 55 60

Cys Glu Ser Ser His Gly Leu Asn Ser Ser Gly Ala Arg Thr Asp Gly
65 70 75 80

Ser Thr Pro Val Arg Arg Ser Gly Thr Pro Ile Arg Ser
85 90

<210> 13

<211> 93

<212> PRT

<213> unknown

<220>

<223> ZF0002333=Rhodococcus erythropolis

<400> 13

Cys His Thr Asp Leu Phe Thr Lys Thr Val Leu Pro Glu Lys Leu Gly
1 5 10 15

Pro Cys Val Phe Gly His Glu Gly Ala Gly Val Val Gln Ala Val Gly
20 25 30

Ser Ser Ile Asp Asn Ile Ala Ala Gly Asp His Val Leu Leu Ser Tyr
35 40 45

Arg Ser Cys Gly Val Cys Arg Gln Cys Leu Ser Asp His Arg Ala Tyr
50 55 60

Cys Glu Ser Ser His Gly Leu Asn Ser Ser Gly Ala Arg Thr Asp Gly
65 70 75 80

Ser Thr Pro Val Arg Arg Asn Gly Thr Pro Ile Arg Ser
85 90

<210> 14

<211> 120

<212> PRT

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<223> ZF0006108= Streptomyces; ZF0002440= Streptomyces; ZF0051302= Bacterium; ZF0003532= Actinomyces; ZF0003548= Nocardiaform;

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Cys Gly Thr Asp Arg Glu Ile Ala Ser Gly Ile Tyr Gly Trp Ala Pro
1 5 10 15

Pro Gly Arg Glu His Leu Val Leu Gly His Glu Ser Leu Gly Arg Val
20 25 30

Arg Thr Ala Pro Asp Gly Ser Gly Phe Ala Ala Gly Asp Leu Val Val
35 40 45

Gly Ile Val Arg Arg Pro Asp Pro Val Pro Cys Gly Ala Cys Ala His
50 55 60

Gly Glu Phe Asp Met Cys Arg Asn Gly Glu Tyr Val Glu Arg Gly Ile
65 70 75 80

Lys Gln Ile Asp Gly Tyr Gly Ser Thr Ser Trp Val Val Asp Ala Asp
85 90 95

Tyr Thr Val Lys Leu Asp Pro Ala Leu Thr Glu Val Gly Val Leu Met
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Glu Pro Thr Thr Val Leu Gly Gln
115 120

<210> 15

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Cys Gly Thr Asp Leu His Ile Arg Ser Trp Asp Gly Trp Ala Gln Lys
1 5 10 15

Thr Ile Ala Thr Pro Leu Thr Leu Gly His Glu Phe Val Gly Glu Val
20 25 30

Val Glu Thr Gly Arg Asp Val Thr Asp Ile Gln Val Gly Asp Leu Val
35 40 45

Ser Gly Glu Gly His Leu Val Cys Gly Lys Cys Arg Asn Cys Leu Ala
50 55 60

Gly Arg Arg His Leu Cys Arg Ala Thr Val Gly Leu Gly Val Gly Arg
65 70 75 80

Asp Gly Ala Phe Ala Glu Tyr Val Val Leu Pro Ala Ser Asn Val Trp
85 90 95

Val His Arg Val Pro Val Asp Leu Asp Val Ala Ala Ile Phe Asp Pro
100 105 110

Phe Gly Asn Ala Val His Thr Ala Leu Ser Phe Pro Leu Val Gly Glu
115 120 125

Asp Val Leu Val Thr Gly Ala Gly Thr Ile Gly Ile
 130 135 140

<210> 16

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 ZF0050330= Bacillus, ZF0002852= Rhodococcus; ZF0050310= Arthrobacter
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 ZF0003765= Streptomyces; ZF0002332= Streptomyces
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<223> ZF0003768= Actinomyces; ZF0002379= Streptomyces coelestis;
 ZF0002443= Streptomyces; ZF0002442= Streptomyces; ZF0002436=
 Streptomyces; ZF0050994= Bacterium; ZF0050992= Bacterium; ZF0050442=
 Bacterium; ZF0002049= Streptomyces; ZF0006069= Streptomyces;

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 Streptomyces; ZF0006092= Streptomyces; ZF0006090= Streptomyces;

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<223> ZF0006084= Streptomyces; ZF0006068= Streptomyces; ZF0050284=
 Rhodococcus; ZF0050028= Agrobacterium tumefaciens; ZF0003540=
 Actinomyces; ZF0003528= Actinomyces; ZF0003529= Actinomyces;

<400> 16

Gly Leu Thr Ile Gly His Glu Pro Val Gly Val Ile Glu Lys Leu Gly
 1 5 10 15

Ser Ala Val Thr Gly Tyr Arg Glu Gly Gln Arg Val Ile Ala Gly Ala
 20 25 30

Ile Cys Pro Asn Phe Asn Ser Tyr Ala Ala Gln Asp Gly Ala Pro Ser
 35 40 45

Gln Asp Gly Ser Tyr Leu Val Ala Ser Gly Ala Cys Gly Cys His Gly
 50 55 60

Tyr Arg Ala Thr Ala Gly Trp Arg Phe Gly Asn Ile Ile Asp Gly Ala
 65 70 75 80

Gln Ala Glu Tyr Leu Leu Val Pro Asp Ala Gln Gly Asn Leu Ala Pro
85 90 95

Val Pro Asp Asn Leu Ser Asp Glu Gln Val Leu Met Cys Pro Asp Ile
100 105 110

Met Ser Thr Gly Phe Lys Gly Ala Glu Asn Ala His Ile Arg Ile Gly
115 120 125

Asp Thr Val Ala Val Phe Ala Gln Gly Pro
130 135

<210> 17

<211> 144

<212> PRT

<213> unknown

<220>

<223> ZF0050197= Pseudomonas oleovorans; ZF0050294= Rhodococcus;
ZF0050330= Bacillus, ZF0002852= Rhodococcus; ZF0050310= Arthrobacter
paraffineus; ZF0002437= Streptomyces; ZF0003712= Micromonospora;
ZF0003765= Streptomyces; ZF0002332= Streptomyces
diatsatochromogenes;

<220>

<223> ZF0003768= Actinomyces; ZF0002379= Streptomyces coelestis;
ZF0002443= Streptomyces; ZF0002442= Streptomyces; ZF0002436=
Streptomyces; ZF0050994= Bacterium; ZF0050992= Bacterium; ZF0050442=
Bacterium; ZF0002049= Streptomyces; ZF0006069= Streptomyces;

<220>

<223> ZF0006075= Streptomyces; ZF0004724= Nocardiaform; ZF0002392=
Actinoplanes nipponensis; ZF0002356= Actinoplanes brasiliensis;
ZF0003501= Actinomyces; ZF0051322= Bacterium; ZF0006078=
Streptomyces; ZF0006092= Streptomyces; ZF0006090= Streptomyces;

<220>

<223> ZF0006084= Streptomyces; ZF0006068= Streptomyces; ZF0050284=
Rhodococcus; ZF0050028= Agrobacterium tumefaciens; ZF0003540=
Actinomyces; ZF0003528= Actinomyces; ZF0003529= Actinomyces;

<400> 17

Cys Gly Thr Asp Leu His Ile Leu Gly Gly Asp Val Pro Glu Val Thr
1 5 10 15

Asp Gly Arg Ile Leu Gly His Glu Ala Val Gly Thr Val Val Glu Val
20 25 30

Gly Asp Gly Val Gln Thr Leu Ala Pro Gly Asp Arg Val Leu Val Ser
 35 40 45

Cys Val Thr Ala Cys Gly Thr Cys Arg Phe Cys Arg Glu Ser Arg Tyr
 50 55 60

Gly Gln Cys Leu Gly Gly Gly Gly Trp Ile Leu Gly His Leu Ile Asp
 65 70 75 80

Gly Thr Gln Ala Glu Leu Val Arg Val Pro Tyr Ala Asp Asn Ser Thr
 85 90 95

His Arg Ile Pro Asp Gly Val Ser Asp Glu Gln Met Leu Met Leu Ala
 100 105 110

Asp Ile Leu Pro Thr Ser Tyr Glu Val Gly Val Leu Asn Gly Cys Leu
 115 120 125

Arg Pro Ala Asp Val Val Val Ile Ile Gly Ala Asp Asp Arg Pro Leu
 130 135 140

<210> 18

<211> 73

<212> PRT

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 18

Val Asp Val Val Val Asp Asn Ala Gly Phe Gly Thr His Gly Ala Phe
 1 5 10 15

Val Asp Glu Asp His Glu Arg Val Thr Ser Glu Ile Gln Leu Asn Ile
 20 25 30

Ala Thr Leu Val Glu Leu Thr His Thr Phe Pro Pro Asp Leu Leu Thr
 35 40 45

Gly Arg Gly Ala Leu Val Asn Ile Ala Ser Thr Ala Ser Phe Gln Pro
 50 55 60

Thr Pro Gly Met Ala Val Tyr Cys Ala
 65 70

<210> 19

<211> 75

<212> PRT

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 19

Val Asp Val Val Val His Asn Ala Gly Phe Gly Thr His Gly Ala Phe
1 5 10 15

Val Asp Glu Asp Leu Glu Arg Val Thr Ser Glu Ile Gln Leu Asn Ile
20 25 30

Ala Thr Leu Val Glu Leu Thr His Thr Phe Leu Pro Asp Leu Leu Thr
35 40 45

Gly Arg Gly Ala Leu Val Asn Ile Ala Ser Thr Ala Ser Phe Gln Pro
50 55 60

Thr Pro Gly Met Ala Val Tyr Cys Ala Thr Lys
65 70 75

<210> 20

<211> 79

<212> PRT

<213> unknown

<220>

<223> ZF0003535= *Actinomyces*

<400> 20

Arg Val Asp Val Val Val His Asn Ala Ala Ile Thr Gln Lys Ala Thr
1 5 10 15

Phe Arg Asp Ile Thr Pro Ala Asp Phe Glu Arg Ile Leu Arg Val Asn
20 25 30

Leu Thr Gly Val Phe Asn Leu Ser Gln Ala Val Ile Pro Leu Met Ile
35 40 45

Gln Arg Gly Gly Gly Ser Ile Val Ser Ile Ser Ser Leu Ser Ala Gln
50 55 60

Asn Gly Gly Gly Ile Phe Gly Gly Ala His Tyr Cys Ala Thr Lys
65 70 75

<210> 21

<211> 76

<212> PRT

<213> unknown

<220>

<223> ZF0003535= Actinomyces

<400> 21

Val Asp Val Val Val Asp Asn Ala Gly Leu Ala Leu Gly Thr Ala Pro
1 5 10 15

Ala Pro Gln Val Pro Leu Lys Asp Trp Gln Thr Met Val Asn Thr Asn
20 25 30

Ile Thr Gly Leu Leu Asn Ile Thr His His Leu Leu Pro Thr Leu Ile
35 40 45

Asp Arg Lys Gly Ile Val Val Asn Leu Ser Ser Val Ala Ala His Tyr
50 55 60

Pro Tyr Thr Gly Gly Asn Val Tyr Cys Ala Ser Lys
65 70 75

<210> 22

<211> 72

<212> PRT

<213> unknown

<220>

<223> ZF0050310= Arthrobacter paraffineus

<400> 22

Gln Gly Ile Gly Tyr Ala Thr Ala Lys Arg Leu Ile Ser Leu Gly Ala
1 5 10 15

Thr Val Ala Ile Gly Asp Ile Asp Glu Ala Thr Leu Ala Arg Ala Ala
20 25 30

Lys Asp Leu Gly Ile Arg Thr Phe Gly Arg Leu Asp Val Thr Asp Pro
35 40 45

Ala Ser Phe Phe Asp Phe Leu Asp Thr Val Glu Gly Glu Leu Gly Pro
50 55 60

Ile Asp Val Leu Ile Asn Asn Ala
65 70

<210> 23

<211> 75

<212> PRT

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 23

Gln Arg Ile Gly Leu Glu Ile Ala Arg Thr Phe Ile Lys Glu Gly Ala
1 5 10 15

Thr Val Val Leu Gly Asp Ile Asn Glu Thr Val Gly Thr Ala Ala Val
20 25 30

Ala Glu Leu Gly Gly Glu Ser Val Ala Arg Phe Ala Ser Cys Asp Val
35 40 45

Arg Asp Ser Gly Gln Val Glu Ala Met Leu Asp Leu Ala Glu Ser Ala
50 55 60

Phe Gly Pro Val Asp Val Met Met Asn Asn Ala
65 70 75

<210> 24

<211> 72

<212> PRT

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 24

Gln Gly Ile Gly Tyr Gln Thr Ala Lys Glu Leu Ile Arg Arg Gly His
1 5 10 15

Arg Val Ala Ile Gly Asp Ile Asp Glu Ala Arg Ala Lys Glu Thr Ala
20 25 30

Ala Glu Leu Gly Val Lys Val Val Thr Arg Leu Asp Val Thr Asp Pro
35 40 45

Asp Ser Phe Lys Asp Phe Leu Asp Leu Val Glu Gly Asp Leu Gly Pro
50 55 60

Leu Asp Val Leu Ile Asn Asn Ala
65 70

<210> 25

<211> 74

<212> PRT

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 25

Gly Ile Gly Leu Glu Ile Ala Arg Thr Phe Ile Lys Glu Gly Ala Thr
1 5 10 15

Val Val Leu Gly Asp Ile Asn Glu Thr Val Gly Thr Ala Ala Val Ala
20 25 30

Glu Leu Gly Gly Glu Ser Val Ala Arg Phe Ala Ser Cys Asp Val Arg
35 40 45

Asp Ser Gly Gln Val Glu Ala Met Leu Asp Leu Ala Glu Ser Ala Phe
50 55 60

Gly Pro Val Asp Val Ile Val Asn Asn Ala
65 70

<210> 26

<211> 74

<212> PRT

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 26

Ile	Gly	Leu	Glu	Ile	Ala	Arg	Thr	Phe	Ile	Lys	Glu	Gly	Ala	Thr	Val
1				5					10					15	

Val	Leu	Gly	Asp	Ile	Asn	Glu	Thr	Val	Gly	Thr	Ala	Ala	Val	Gly	Glu
			20					25					30		

Leu	Gly	Gly	Glu	Ser	Val	Ala	Arg	Phe	Ala	Ser	Cys	Asp	Val	Arg	Asp
		35					40					45			

Ser	Gly	Gln	Val	Glu	Ala	Met	Leu	Asp	Leu	Ala	Glu	Ser	Ala	Phe	Gly
	50					55					60				

Pro	Val	Asp	Val	Met	Val	Asn	Asn	Ala	Gly
65						70			

<210> 27

<211> 62

<212> PRT

<213> unknown

<220>

<223> ZF0002333= *Rhodococcus erythropolis*

<400> 27

Val	Pro	Val	Ala	Val	Val	Asp	Leu	His	Ile	Glu	Ser	Ala	Lys	Glu	Thr
1				5					10					15	

Val	Ala	Leu	Ile	Glu	Ser	Gln	Tyr	Gly	Thr	Pro	Ala	Leu	Ala	Leu	Glu
			20					25				30			

Ala	Asp	Val	Arg	Asp	Arg	Ala	Ala	Val	Ser	Ala	Ala	Phe	Glu	Ala	Thr
		35				40						45			

Val Ala Glu Trp Gly Arg Phe Asp Tyr Leu Val Asn Asn Ala
 50 55 60

<210> 28

<211> 74

<212> PRT

<213> unknown

<220>

<223> ZF0002333= Rhodococcus erythropolis

<400> 28

Leu Gly Arg Glu Ile Ala Leu Lys Leu Ala Ser Glu Gly Ala Ser Val
 1 5 10 15

Val Val Asn Asp Leu Asp Pro Glu Pro Ala Ala Gln Thr Glu Arg Asp
 20 25 30

Ile Lys Ala Thr Gly Gly Gln Ala Val Ser Cys Val Gly Ser Val Ala
 35 40 45

Glu Asp Gly Phe Ala Glu Arg Phe Val Asn Thr Ala Val Glu Ser Phe
 50 55 60

Gly Gly Leu Asp Val Met Val Asn Asn Ala
 65 70

<210> 29

<211> 76

<212> PRT

<213> unknown

<220>

<223> ZF0002333= Rhodococcus erythropolis

<400> 29

Ala Gly Leu Gly Val Glu Phe Ala His Arg Phe Ala Ala Arg Gly Ala
 1 5 10 15

Asn Leu Val Leu Val Ala Arg Arg Ala Asp Arg Leu Glu Ala Leu Ala
 20 25 30

Thr Glu Leu Arg Val Ala His Gly Ile Thr Val Thr Val Leu Pro Ala
35 40 45

Asp Leu Ala Ala Pro Gly Val Gly Ala Thr Leu His Gln Glu Leu Thr
50 55 60

Ser Arg Gly Ile Thr Val Thr Ser Leu Ile Asn Asn
65 70 75

<210> 30

<211> 72

<212> PRT

<213> unknown

<220>

<223> ZF0003535= Actinomyces

<400> 30

Pro Ala Asp Gly Tyr Gln Thr Ala Lys Glu Leu Ile Arg Arg Gly His
1 5 10 15

Arg Val Ala Ile Val Asp Ile Asp Glu Ala Arg Ala Lys Gly Ala Ala
20 25 30

Ala Glu Leu Gly Val Lys Val Val Thr Arg Leu Asp Val Thr Glu Pro
35 40 45

Asp Ser Phe Thr Thr Phe Leu Asp Leu Val Glu Arg Glu Leu Gly Pro
50 55 60

Leu Asp Ile Leu Val Asn Asn Ala
65 70

<210> 31

<211> 67

<212> PRT

<213> unknown

<220>

<223> ZF0050310= Arthrobacter paraffineus

<400> 31

Ala Thr Asp Gly Ala Arg Val Ala Val Val Asp Leu His Ile Glu Ser
1 5 10 15

Ala Glu Glu Thr Val Ala Leu Ile Glu Ser Gln Tyr Gly Thr Pro Ala
20 25 30

Leu Ala Leu Glu Ala Asp Val Arg Asp Arg Ala Ala Val Ser Ala Ala
35 40 45

Phe Glu Ala Thr Val Ala Glu Trp Gly Arg Phe Asp Tyr Leu Val Asn
50 55 60

Asn Ala Gly
65

<210> 32

<211> 67

<212> PRT

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 32

Ala Ala Asp Gly Ala Arg Val Ala Val Val Asp Leu His Ile Glu Ser
1 5 10 15

Ala Lys Glu Thr Val Ala Leu Ile Glu Ser Gln Tyr Gly Thr Pro Ala
20 25 30

Leu Ala Leu Glu Ala Asp Val Arg Asp Arg Ala Ala Val Ser Ala Ala
35 40 45

Phe Glu Ala Thr Val Ala Glu Trp Gly Arg Phe Asp Tyr Leu Val Asn
50 55 60

Asn Ala Gly
65

<210> 33

<211> 348

<212> PRT

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 33

Met Lys Ala Ile Gln Tyr Ala Arg Ile Gly Ala Glu Pro Glu Leu Thr
1 5 10 15

Glu Ile Pro Lys Pro Glu Pro Gly Pro Gly Glu Val Leu Leu Glu Val
20 25 30

Thr Ala Ala Gly Val Cys His Ser Asp Asp Phe Ile Met Ser Leu Pro
35 40 45

Glu Glu Gln Tyr Thr Tyr Gly Leu Pro Leu Thr Leu Gly His Glu Gly
50 55 60

Ala Gly Arg Val Ala Ala Val Gly Glu Gly Val Glu Gly Leu Asp Ile
65 70 75 80

Gly Thr Asn Val Val Val Tyr Gly Pro Trp Gly Cys Gly Ser Cys Trp
85 90 95

His Cys Ser Gln Gly Leu Glu Asn Tyr Cys Ser Arg Ala Lys Glu Leu
100 105 110

Gly Ile Asn Pro Pro Gly Leu Gly Ala Pro Gly Ala Leu Ala Glu Phe
115 120 125

Met Ile Val Asp Ser Pro Arg His Leu Val Pro Ile Gly Asp Leu Asp
130 135 140

Pro Val Lys Thr Val Pro Leu Thr Asp Ala Gly Leu Thr Pro Tyr His
145 150 155 160

Ala Ile Lys Arg Ser Leu Pro Lys Leu Arg Gly Gly Ala Tyr Ala Val
165 170 175

Val Ile Gly Thr Gly Gly Leu Gly His Val Ala Ile Gln Leu Leu Arg
180 185 190

His Leu Ser Ala Ala Thr Val Ile Ala Leu Asp Val Ser Ala Asp Lys
195 200 205

Leu Glu Leu Ala Thr Lys Val Gly Ala His Glu Val Val Leu Ser Asp
210 215 220

Lys Asp Ala Ala Glu Asn Val Arg Arg Ile Thr Gly Ser Gln Gly Ala
225 230 235 240

Ala Leu Val Leu Asp Phe Val Gly Tyr Gln Pro Thr Ile Asp Thr Ala
245 250 255

Met Ala Val Ala Gly Val Gly Ser Asp Val Thr Ile Val Gly Ile Gly
260 265 270

Asp Gly Gln Ala His Ala Lys Val Gly Phe Phe Gln Ser Pro Tyr Glu
275 280 285

Ala Ser Val Thr Val Pro Tyr Trp Gly Ala Arg Asn Glu Leu Ile Glu
290 295 300

Leu Ile Asp Leu Ala His Ala Gly Ile Phe Asp Ile Ala Val Glu Thr
305 310 315 320

Phe Ser Leu Asp Asn Gly Ala Glu Ala Tyr Arg Arg Leu Ala Ala Gly
325 330 335

Thr Leu Ser Gly Arg Ala Val Val Val Pro Gly Leu
340 345

<210> 34

<211> 348

<212> PRT

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 34

Met Lys Ala Ile Gln Tyr Thr Arg Ile Gly Ala Glu Pro Glu Leu Thr
1 5 10 15

Glu Ile Pro Lys Pro Glu Pro Gly Pro Gly Glu Val Leu Leu Glu Val
20 25 30

Thr Ala Ala Gly Val Cys His Ser Asp Asp Phe Ile Met Ser Leu Pro
35 40 45

Glu Glu Gln Tyr Thr Tyr Gly Leu Pro Leu Thr Leu Gly His Glu Gly
50 55 60

Ala Gly Arg Val Ala Ala Val Gly Glu Gly Val Glu Gly Leu Asp Ile
65 70 75 80

Gly Thr Asn Val Val Val Tyr Gly Pro Trp Gly Cys Gly Ser Cys Trp
85 90 95

His Cys Ser Gln Gly Leu Glu Asn Tyr Cys Ser Arg Ala Lys Glu Leu
100 105 110

Gly Ile Asn Pro Pro Gly Leu Gly Ala Pro Gly Ala Leu Ala Glu Phe
115 120 125

Met Ile Val Asp Ser Pro Arg His Leu Val Pro Ile Gly Asp Leu Asp
130 135 140

Pro Val Lys Thr Val Pro Leu Thr Asp Ala Gly Leu Thr Pro Tyr His
145 150 155 160

Ala Ile Lys Arg Ser Leu Pro Lys Leu Arg Gly Gly Ala Tyr Ala Val
165 170 175

Val Ile Gly Thr Gly Gly Leu Gly His Val Ala Ile Gln Leu Leu Arg
180 185 190

His Leu Ser Ala Ala Thr Val Ile Ala Leu Asp Val Ser Ala Asp Lys
195 200 205

Leu Glu Leu Ala Thr Lys Val Gly Ala His Glu Val Val Leu Ser Asp
210 215 220

Lys Asp Ala Ala Glu Asn Val Arg Arg Ile Thr Gly Ser Gln Gly Ala
225 230 235 240

Ala Leu Val Leu Asp Phe Val Gly Tyr Gln Pro Thr Ile Asp Thr Ala
245 250 255

Met Ala Val Ala Gly Val Gly Ser Asp Val Thr Ile Val Gly Ile Gly
260 265 270

Asp Gly Gln Ala His Ala Lys Val Gly Phe Phe Gln Ser Pro Tyr Glu
275 280 285

Ala Ser Val Thr Val Pro Tyr Trp Gly Ala Arg Asn Glu Leu Ile Glu
290 295 300

Leu Ile Asp Leu Ala His Ala Gly Ile Phe Asp Ile Ala Val Glu Thr
305 310 315 320

Phe Ser Leu Asp Asn Gly Ala Glu Ala Tyr Arg Arg Leu Ala Ala Gly
325 330 335

Thr Leu Ser Gly Arg Ala Val Val Val Pro Gly Leu
340 345

<210> 35

<211> 488

<212> DNA

<213> unknown

<220>

<223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
ZF0050197= Pseudomonas oleovorans; ZF0050294= Rhodococcus;
ZF0050330= Bacillus; ZF0051303= Bacterium; ZF0051337= Methylobacter;
ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;

<220>

<223> ZF0050544= Phyllobacterium rubiacearum; ZF0002852= Rhodococcus;
ZF0050310= Arthrobacter paraffineus; ZF0002862= Streptomyces
clavuligerus; ZF0050292= Bacterium; ZF0002031= Streptomyces;
ZF0002349= Streptomyces spectabilis; ZF0002434= Streptomyces;

<220>

<223> ZF0002437= Streptomyces; ZF0003712= Micromonospora; ZF0003765=
Streptomyces; ZF0051305= Bacterium; ZF0003513= Actinomyces;
ZF0050993= Kocuria; ZF0002018= Streptomyces; ZF0003767= Actinomyces;
ZF0002332= Streptomyces diastatochromogenes; ZF0003768= Actinomyces;

<220>

<223> ZF0002379= Streptomyces coelestis; ZF0002351= Nonomuraea
roseoviolacea; ZF0003769= Actinomyces;

<400> 35

gggccatggg gttgtggcaa ctgttggcac tgctcacaag gactcgagaa ctattgctct 60
cgcgcccaag aactcggaat caatcctccc ggtctcgggtg caccgggcgc gttggccgag 120
ttcatgatcg tcgattctcc tcgccacctt gtcccgatcg gtgacctga cccggtcaag 180
acggtgccgc tgaccgacgc cgggtctgacg ccgtatcacg cgatcaagcg ttctctgccg 240

aaacttcgcg gaggtctgta cgcggttgtc attggtaccg gcgggctcgg ccacgtcgcc 300
 attcagctcc tccgtcacct ctcggcgtca acggtcacgc ctttgacgt gagcgcgac 360
 aagctcgaac tggcaaccaa ggtaggcgct cacgaagtgg ttctgtccga caaggacgcg 420
 gccgagaacg tccgcaagat cactggaagt caaggcgccg cactggttct cgacttcgtt 480
 ggctacca 488

<210> 36

<211> 385

<212> DNA

<213> unknown

<220>

<223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
 ZF0050197= Pseudomonas oleovorans; ZF0050294= Rhodococcus;
 ZF0050330= Bacillus; ZF0051303= Bacterium; ZF0051337= Methylobacter;
 ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;

<220>

<223> ZF0050544= Phyllobacterium rubiacearum; ZF0002852= Rhodococcus;
 ZF0050310= Arthrobacter paraffineus; ZF0002862= Streptomyces
 clavuligerus; ZF0050292= Bacterium; ZF0002031= Streptomyces;
 ZF0002349= Streptomyces spectabilis; ZF0002434= Streptomyces;

<220>

<223> ZF0002437= Streptomyces; ZF0003712= Micromonospora; ZF0003765=
 Streptomyces; ZF0051305= Bacterium; ZF0003513= Actinomyces;
 ZF0050993= Kocuria; ZF0002018= Streptomyces; ZF0003767= Actinomyces;
 ZF0002332= Streptomyces diastatochromogenes; ZF0003768= Actinomyces;
 ZF0002379=

<220>

<223> Streptomyces coelestis; ZF0002351= Nonomuraea roseoviolacea;
 ZF0003769= Actinomyces;

<400> 36

gggccatggg gttgtggcaa ctggtggcac tgctcacaag gactcgagaa ctattgctct 60
 cgcgccaag aactcggaat caatcctccc ggtctcgggtg caccgcgcg gttggccgag 120
 ttcatgatcg tcgattctcc tcgccacctt gtcccgatcg gtgacctga cccggtcaag 180
 acggtgccgc tgaccgacgc cggctgacg ccgtatcacg cgatcaagcg ttctctgccg 240
 aaacttcgcg gaggtctgta cgcggttgtc attggtaccg gcgggctcgg ccacgtcacc 300
 attcagctcc tccgtcacct ctcggcggca acggtcacgc ctttgacgt gagcgcgac 360

aagctcgaac tggcaaccaa ggtag

385

<210> 37

<211> 486

<212> DNA

<213> unknown

<220>

<223> ZF0050286= *Corynebacterium hoagii*

<400> 37

ggcccttggg gttgcggacg ttgctggcac tgcgcgcagg ggctcgagaa ctactgctcc	60
cgcgcaaggg aactcggcat cgccccaccc ggcttgggcg cgccggggcg gatcgccgag	120
tacatgatcg tcgactcgcc gcgtcacctg gtcccgatcg gtgacctga ccccgtcacg	180
acggtgccgc tgaccgacgc cgggctcacc ccgtaccacg cgatcaaacg gtcgctcggc	240
aagctccgcg ccggctcgta cgcagtcgtg atcggcaccg gaggcctcgg acacgtcggc	300
atccagctgc tccgccacct gtcccctgca cgcacatcg cctcgcacgt caacgacgag	360
aagctcgcgt tcgcccgcga ggtcggcgcg cacgagaccg tgttgtcgaa cgccgacgcc	420
gccgcgaacg tccggaagat cacgggttcg gccggtgccg cgctggctct agacttcgtc	480
ggctac	486

<210> 38

<211> 483

<212> DNA

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 38

ggcccatggg gctgtggcag ctgttggcac tgctcgcaag gactcgaaaa ctactgttct	60
cgggcaaaaag aactcggcat caatcctcct ggtctcggcg caccgggcgc gttggccgaa	120
ttcatgatcg tcgattcacc tcgccacctc gtcccgatcg gcgacctga tccggtcaag	180
acggtgccac tgaccgacgc cgggtctgact ccgtatcacg cgatcaagcg ttactgccg	240
aaacttcgcg gtggcgcgta cgccgctcgtc atcgggtaccg gcggtctcgg ccatgtcgcc	300

atccaactcc tccgccacct ctcggcagca accgtcatcg cactcgacgt gagcgcgac 360
 aagctcgtagc tggcaaccaa ggtaggcgct cacgaagtgg tcctgtccga caaggacgag 420
 gccgagaacg tccgcaggat caccggaagt caggcgccg cactggttct tgacttcgtt 480
 ggc 483

<210> 39

<211> 210

<212> DNA

<213> unknown

<220>

<223> ZF0004210= Actinomyces; ZF0004212= Actinomyces; ZF0004211=
 Actinomyces; ZF0003860= Actinomyces; ZF0004218= Actinomyces;
 ZF0003868= Actinomadura; ZF0004213= Actinomyces; ZF0003876=
 Actinomyces; ZF0003866= Actinomyces; ZF0003864= Actinomyces;

<220>

<223> ZF0003862= Actinomadura; ZF0003869= Actinomyces; ZF0003867=
 Actinomadura; ZF0004216= Actinomyces; ZF0004235= Actinomyces;
 ZF0004209= Actinomadura; ZF0004214= Actinomyces; ZF0003871=
 Actinomyces; ZF0004063= Actinomadura; ZF0004052= Actinomadura;

<220>

<223> ZF0006405= Streptomyces; ZF0003865= Actinomadura; ZF0004047=
 Actinomadura; ZF0004070= Actinomyces; ZF0004085= Actinomyces;
 ZF0004217= Actinomyces; ZF0004089= Actinomadura; ZF0004090=
 Actinomadura; ZF0006138= Streptomyces; ZF0004236= Actinomadura;

<220>

<223> ZF0051203= Bacterium;

<400> 39

ggaccgtggg gctgcggcac gtgcgtcaag tgcgccgagg gcaaggagaa ctactgcctg 60
 cgcgccaagg aactcggcat cgccccgccc ggactcggct cgcccggcgc catggccgag 120
 tacatgatcg tcgacgaccc gcgccacctg gtgccgctcg gcggtctcga cccggtccag 180
 gccgtgccgc tcactgacgc gggcctgaca 210

<210> 40

<211> 282

<212> DNA

<213> unknown

<220>

<223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
 ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;
 ZF0050544= Phyllobacterium rubiacearum; ZF0002031= Streptomyces;
 ZF0002349= Streptomyces spectabilis; ZF0002434= Streptomyces;
 ZF0050993= Kocuria;

<220>

<223> ZF0002018= Streptomyces; ZF0003767= Actinomyces; ZF0003764=
 Streptomyces; ZF0002331= Actinoplanes philippinensis; ZF0002441=
 Streptomyces; ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240=
 Bacterium; ZF0002333= Rhodococcus erythropolis;

<220>

<223> ZF0003713= Micromonospora; ZF0004980= Streptomyces; ZF0004821=
 Actinomyces; ZF0002359= Actinoplanes ianthinogenes; ZF0002396=
 Actinoplanes; ZF0003781= Actinomyces; ZF0003512= Actinomyces;
 ZF0006093= Streptomyces; ZF0006103= Streptomyces;

<220>

<223> ZF0006087= Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium;
 ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538=
 Actinomyces; ZF0003535= Actinomyces;

<400> 40

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gtcggcgacc acgtcggttct gtccttcatt ccggcttggtg gaacctgtcc ggcgtgttcg	180
gccggggcatc agaatctttg tgacctcggg atgggcctcc tcagcggcca agccatcagc	240
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<210> 41

<211> 276

<212> DNA

<213> unknown

<220>

<223> ZF0002326= Actinoplanes missouriensis; ZF0003505= Streptomyces;
 ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;
 ZF0050544= Phyllobacterium rubiacearum; ZF0002031= Streptomyces;
 ZF0002349= Streptomyces spectabilis; ZF0002434= Streptomyces;
 ZF0050993= Kocuria;

<220>

<223> ZF0002018= Streptomyces; ZF0003767= Actinomyces; ZF0003764= Streptomyces; ZF0002331= Actinoplanes philippinensis; ZF0002441= Streptomyces; ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240= Bacterium; ZF0002333= Rhodococcus erythropolis;

<220>

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<220>

<223> ZF0006087= Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium; ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538= Actinomyces; ZF0003535= Actinomyces;

<400> 41

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ggccacgaag gcgcgggcat agtggagaaa gtcggccccc gcgtgcgaga cgctcgaggta	120
ggcgatcacg tcgtcctctc cttcattccc tcgtgtggac gctgccgttg gtgcgcagtc	180
ggacagagca acctctgcga cctcggcgcc attctgatgg ccggcgacaca ggctcgacggg	240
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<210> 42

<211> 276

<212> DNA

<213> unknown

<220>

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<220>

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<220>

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<220>

<223> ZF0006087= Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium;
ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538=
Actinomyces; ZF0003535= Actinomyces;

<400> 42

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ggcgatcacg tcgtcctctc cttcattccc tcgtgtggac gctgccgttg gtgcgcagtc      180
ggacagagca acctctgcga cctcggcgcc attctgatgg ccggcgacaca ggtcgacggg      240
acgtaccgcg cgacagctcg cgggcacgac gtcgga                                276
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<210> 43

<211> 276

<212> DNA

<213> unknown

<220>

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ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;
ZF0050544= Phyllobacterium rubiacearum; ZF0002031= Streptomyces;
ZF0002349= Streptomyces spectabilis; ZF0002434= Streptomyces;
ZF0050993= Kocuria;

<220>

<223> ZF0002018= Streptomyces; ZF0003767= Actinomyces; ZF0003764=
Streptomyces; ZF0002331= Actinoplanes philippinensis; ZF0002441=
Streptomyces; ZF0051307= Bacterium; ZF0051301= Bacterium; ZF0051240=
Bacterium; ZF0002333= Rhodococcus erythropolis;

<220>

<223> ZF0003713= Micromonospora; ZF0004980= Streptomyces; ZF0004821=
Actinomyces; ZF0002359= Actinoplanes ianthinogenes; ZF0002396=
Actinoplanes; ZF0003781= Actinomyces; ZF0003512= Actinomyces;
ZF0006093= Streptomyces; ZF0006103= Streptomyces;

<220>

<223> ZF0006087= Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium;
ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538=
Actinomyces; ZF0003535= Actinomyces;

<400> 43

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 ggcatcacg tcgtcctctc cttcattccc tcgtgtggac gctgccgttg gtgcgcagtc 180
 ggacagagca acctctgcga cctcgggccc attctgatgg ccggcgacac ggtcgacggg 240
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<210> 44

<211> 276

<212> DNA

<213> unknown

<220>

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 ZF0051321= Bacterium; ZF0050782= Lactobacillus bulgaricus;
 ZF0050544= Phyllobacterium rubiacearum; ZF0002031= Streptomyces;
 ZF0002349= Streptomyces spectabilis; ZF0002434= Streptomyces;
 ZF0050993= Kocuria;

<220>

<223> ZF0002018= Streptomyces; ZF0003767= Actinomyces; ZF0003764=
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<220>

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 ZF0006093= Streptomyces; ZF0006103= Streptomyces;

<220>

<223> ZF0006087= Streptomyces; ZF0050446= Bacterium; ZF0050445= Bacterium;
 ZF0006086= Streptomyces; ZF0002322= Rhodococcus; ZF0003538=
 Actinomyces; ZF0003535= Actinomyces;

<400> 44

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 ggcatcacg tcgtcctctc cttcattccc tcgtgtggac gctgccgttg gtgcgcagtc 180
 ggacagagca acctctgcga cctcgggccc attctgatgg ccggcgacac ggtcgacggg 240
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<210> 45

<211> 276

<212> DNA

<213> unknown

<220>

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ZF0051321= *Bacterium*; ZF0050782= *Lactobacillus bulgaricus*;
ZF0050544= *Phyllobacterium rubiacearum*; ZF0002031= *Streptomyces*;
ZF0002349= *Streptomyces spectabilis*; ZF0002434= *Streptomyces*;
ZF0050993= *Kocuria*;

<220>

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Streptomyces; ZF0002331= *Actinoplanes philippinensis*; ZF0002441=
Streptomyces; ZF0051307= *Bacterium*; ZF0051301= *Bacterium*; ZF0051240=
Bacterium; ZF0002333= *Rhodococcus erythropolis*;

<220>

<223> ZF0003713= *Micromonospora*; ZF0004980= *Streptomyces*; ZF0004821=
Actinomyces; ZF0002359= *Actinoplanes ianthinogenes*; ZF0002396=
Actinoplanes; ZF0003781= *Actinomyces*; ZF0003512= *Actinomyces*;
ZF0006093= *Streptomyces*; ZF0006103= *Streptomyces*;

<220>

<223> ZF0006087= *Streptomyces*; ZF0050446= *Bacterium*; ZF0050445= *Bacterium*;
ZF0006086= *Streptomyces*; ZF0002322= *Rhodococcus*; ZF0003538=
Actinomyces; ZF0003535= *Actinomyces*;

<400> 45

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ggccacgaag gcgcgggcat agtggagaaa gtcggccccc gcgtgcgaga cgtcgaggta	120
ggcgatcacg tcgtcctctc cttcattccc tcgtgtggac gctgccgttg gtgcgcagtc	180
ggacagagca acctctgcga cctcggcgcc attctgatgg ccggcgacac ggtcgacggg	240
acgtaccgcg cgacagctcg cgggcacgac gtcgga	276

<210> 46

<211> 279

<212> DNA

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 46

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 gggcacgaag gagcgggggt ggtcgaggcc gtcggctcgt cgatcgacag cattgcgccc 120
 ggtgatcacg tgttgctgag ctaccgcagt tgcggtgtgt gcaggcagt cctcagcgg 180
 catcgggctg actgcgaaag ctcacacggg ctcaacagct ctggcgacag caccgacggc 240
 tcgacgccgg tccggcgaag cggaactccg atacggtcc 279

<210> 47

<211> 279

<212> DNA

<213> unknown

<220>

<223> ZF0002333= *Rhodococcus erythropolis*

<400> 47

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 ggacacgaag gcgccggcgt cgtgcaagcc gttggctcgt cgatcgacaa catcgcggct 120
 ggtgatcacg tattgctgag ctaccgcagt tgcggtgtat gcaggcaatg tctcagcgac 180
 catcgggctg actgcgaaag ctcacacggg ctcaacagct ctggcgacag caccgacggc 240
 tcgacgccgg tccggcgaag cggaactccg atacggtcc 279

<210> 48

<211> 360

<212> DNA

<213> unknown

<220>

<223> ZF0051303= *Bacterium*; ZF0051337= *Methylomonas*; ZF0002862= *Streptomyces clavuligerus*; ZF0050292= *Bacterium*; ZF0051305= *Bacterium*; ZF0003513= *Actinomyces*; ZF0002351= *Nonomuraea roseoviolacea*; ZF0003769= *Actinomyces*; ZF0002017= *Streptomyces*; ZF0051306= *Bacterium*;

<220>

<223> ZF0002016= *Streptomyces*; ZF0003504= *Actinomyces*; ZF0006073= *Streptomyces*; ZF0003770= *Actinomyces*; ZF0002352= *Actinoplanes italicus*; ZF0002378= *Streptomyces aureomonopodiales*; ZF0006089= *Streptomyces*; ZF0006106= *Streptomyces*; ZF0051325= *Bacterium*;

<220>

<223> ZF0006108= Streptomyces; ZF0002440= Streptomyces; ZF0051302= Bacterium; ZF0003532= Actinomyces; ZF0003548= Nocardiaform;

<400> 48

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cacctcgctcc tgcgggcacga atcgctgggc cgagtacgca ccgcgcccga cggcagcgggt	120
ttcgccgccg gtgatctcgt cgtcgggatac gtgcgcaggc ccgatccgggt gccgtgcggg	180
gcgtgtgcgc acggtgagtt cgacatgtgc cgcaacgggtg agtacgtcga gcgcggggatc	240
aagcagatcg acgggtacgg gtcgacgtcg tgggtgggtg acgccgacta cacggtcaag	300
ctggaccccg cgctcaccga ggtgggtgtg ctgatggaac cgacgacgggt gcttggccaa	360

<210> 49

<211> 421

<212> DNA

<213> unknown

<220>

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<223> ZF0002016= Streptomyces; ZF0003504= Actinomyces; ZF0006073= Streptomyces; ZF0003770= Actinomyces; ZF0002352= Actinoplanes italicus; ZF0002378= Streptomyces aureomonopodiales; ZF0006089= Streptomyces; ZF0006106= Streptomyces; ZF0051325= Bacterium;

<220>

<223> ZF0006108= Streptomyces; ZF0002440= Streptomyces; ZF0051302= Bacterium; ZF0003532= Actinomyces; ZF0003548= Nocardiaform;

<400> 49

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gacatccagg tcggcgacct ggtcagcggc gagggccacc tggctctcgg caagtgccgc	180
aactgcctgg ccggccgccg tcacctgtgc cgcgcgaccg tcggcctcgg tgtcggccgt	240
gacggcgccct tcgccgagta cgtgggtgctg cccgcctcca acgtgtgggt gcaccgggtg	300
ccggtcgacc tcgacgtcgc cgcgatcttc gaccggttcg gcaacgcgggt gcacaccgcg	360

ctctccttcc cgctcgtcgg cgaggacgtg ctggtcaccg gtgccggtac catcggcatc 420
t 421

<210> 50

<211> 414

<212> DNA

<213> unknown

<220>

<223> ZF0050197= Pseudomonas oleovorans; ZF0050294= Rhodococcus;
ZF0050330= Bacillus, ZF0002852= Rhodococcus; ZF0050310= Arthrobacter
paraffineus; ZF0002437= Streptomyces; ZF0003712= Micromonospora;
ZF0003765= Streptomyces; ZF0002332= Streptomyces
diatsatochromogenes;

<220>

<223> ZF0003768= Actinomyces; ZF0002379= Streptomyces coelestis;
ZF0002443= Streptomyces; ZF0002442= Streptomyces; ZF0002436=
Streptomyces; ZF0050994= Bacterium; ZF0050992= Bacterium; ZF0050442=
Bacterium; ZF0002049= Streptomyces; ZF0006069= Streptomyces;

<220>

<223> ZF0006075= Streptomyces; ZF0004724= Nocardiaform; ZF0002392=
Actinoplanes nipponensis; ZF0002356= Actinoplanes brasiliensis;
ZF0003501= Actinomyces; ZF0051322= Bacterium; ZF0006078=
Streptomyces; ZF0006092= Streptomyces; ZF0006090= Streptomyces;

<220>

<223> ZF0006084= Streptomyces; ZF0006068= Streptomyces; ZF0050284=
Rhodococcus; ZF0050028= Agrobacterium tumefaciens; ZF0003540=
Actinomyces; ZF0003528= Actinomyces; ZF0003529= Actinomyces;

<400> 50

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ggttaccgag agggccaacg cgtgatcgcc ggcgcgatct gcccgaactt caattcgat 120
gccgcgcagg atggcgcgcc gtcgcaggat ggcagctacc tggcggccag cggcgcgatgc 180
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caggccgaat acctgctggt tcccgatgcg cagggaatc tggcgccggt tccggacaac 300
ctgagcgatg aacaggtgct gatgtgcccg gacatcatgt ccaccggctt caaaggcgca 360
gagaacgcac acatccgcat cggcgacacg gtggcggtat ttgcgcaggg acca 414

<210> 51

<211> 432

<212> DNA

<213> unknown

<220>

<223> ZF0050197= *Pseudomonas oleovorans*; ZF0050294= *Rhodococcus*;
ZF0050330= *Bacillus*, ZF0002852= *Rhodococcus*; ZF0050310= *Arthrobacter*
paraffineus; ZF0002437= *Streptomyces*; ZF0003712= *Micromonospora*;
ZF0003765= *Streptomyces*; ZF0002332= *Streptomyces*
diatsatochromogenes;

<220>

<223> ZF0003768= *Actinomyces*; ZF0002379= *Streptomyces coelestis*;
ZF0002443= *Streptomyces*; ZF0002442= *Streptomyces*; ZF0002436=
Streptomyces; ZF0050994= *Bacterium*; ZF0050992= *Bacterium*; ZF0050442=
Bacterium; ZF0002049= *Streptomyces*; ZF0006069= *Streptomyces*;

<220>

<223> ZF0006075= *Streptomyces*; ZF0004724= *Nocardiaform*; ZF0002392=
Actinoplanes nipponensis; ZF0002356= *Actinoplanes brasiliensis*;
ZF0003501= *Actinomyces*; ZF0051322= *Bacterium*; ZF0006078=
Streptomyces; ZF0006092= *Streptomyces*; ZF0006090= *Streptomyces*;

<220>

<223> ZF0006084= *Streptomyces*; ZF0006068= *Streptomyces*; ZF0050284=
Rhodococcus; ZF0050028= *Agrobacterium tumefaciens*; ZF0003540=
Actinomyces; ZF0003528= *Actinomyces*; ZF0003529= *Actinomyces*;

<400> 51

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ccgggcgacg gcgtgctcgt ctctgtgtgtc accgcatgcg gtacgtgccg gttctgccgc	180
gagagccgct acgggcaatg cctcggaggc ggcggctgga tcctcggaca cctgatcgac	240
ggcaccacag ccgaactcgt ccgagttccg tacgccgaca attcgacca ccgcaccccc	300
gacgggtgtga gcgacgagca gatgctcatg ctccgccgaca tcctgcccac ctctacgag	360
gtcgggtgtt tcaacggctg tctccggccg gcggacgtcg tcgtcatcat cggggccgac	420
gatcggcctc tt	432

<210> 52

<211> 220

<212> DNA

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 52

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tcacgagcgc gtcacgtccg agattcagct caacatcgcc acgctggtcg agctgacaca      120
cacattcccc cccgaccttc tcaccggccg cggagcactg gtcaacatcg ccagcacagc      180
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<210> 53

<211> 226

<212> DNA

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 53

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tctcgagcgc gtcacgtccg agattcagct caacatcgcc acgctggtcg agctgacaca      120
cacattcctg cccgaccttc tcaccggccg cggagcactg gtcaacatcg ccagcacagc      180
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<210> 54

<211> 237

<212> DNA

<213> unknown

<220>

<223> ZF0003535= *Actinomyces*

<400> 54

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acccccgccg attttgagcg catcctgcgg gtgaacctga ccggcgtctt caacctgagc      120
caagccgtca ttcccttgat gattcagcgc ggcggaggaa gcatcgtctc gatttcctcg      180

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ctgtcggcgc agaacggcgg ggggatcttc ggcggcgccc actattgcgc aaccaag 237

<210> 55

<211> 229

<212> DNA

<213> unknown

<220>

<223> ZF0003535= *Actinomyces*

<400> 55

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ccaccatctc ctgccgacac tgatcgaccg taaaggtatc gtcgtcaacc tttcgtctgt 180

tgccgcgcac tatccctata cgggcggcaa tgtatactgc gcctccaag 229

<210> 56

<211> 216

<212> DNA

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 56

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ggcgacatcg acgaagccac tctcgcgcga gcagccaagg atttgggcat ccgcacgttc 120

gggcgcctcg acgtcaccga ccccgctcgt ttcttcgact tcctcgacac cgtcgaaggt 180

gaactcggcc cgatcgacgt gctgatcaac aacgcg 216

<210> 57

<211> 225

<212> DNA

<213> unknown

<220>

<223> ZF0080310= *Arthrobacter paraffineus*

<400> 57

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ggcgacatca acgaaaccgt gggaacgggt gcggtcgccg aactcgggtg agagtcgggc	120
gcccgtttcg cttcctgcga cgtgcgtgac tccggacagg tcgaggccat gctcgatctg	180
gccgaaagcg ctttcgggtcc agtcgatgtc atgatgaaca acgcg	225

<210> 58

<211> 216

<212> DNA

<213> unknown

<220>

<223> ZF0080310= *Arthrobacter paraffineus*

<400> 58

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ggcgacatcg acgaggcacg tgetaaggag accgccgccg aactgggggt taaggttgtc	120
acccgcctcg atgtcaccga ccctgactcg ttcaaagact ttctcgacct agtcgagggg	180
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<210> 59

<211> 222

<212> DNA

<213> unknown

<220>

<223> ZF0080310= *Arthrobacter paraffineus*

<400> 59

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cgtttcgctt cctgcgacgt gcgtgactcc ggacaggtcg aggccatgct cgatctggcc	180
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<210> 60

<211> 222

<212> DNA

<213> unknown

<220>

<223> ZF0080310= *Arthrobacter paraffineus*

<400> 60

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ttcgcttcct gcgacgtgcg tgactccgga caggctcgagg ccatgctcga tctggccgaa      180
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<210> 61

<211> 186

<212> DNA

<213> unknown

<220>

<223> ZF0002333= *Rhodococcus erythropolis*

<400> 61

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<210> 62

<211> 222

<212> DNA

<213> unknown

<220>

<223> ZF0002333= *Rhodococcus erythropolis*

<400> 62

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gtctcgtgcg tcggctccgt tgccgaggac gggttcgccg aacgcttcgt gaacactgcc      180
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<211> 231

<212> DNA

<213> unknown

<220>

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<400> 63

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<212> DNA

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<223> ZF0003535= *Actinomyces*

<400> 64

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<212> DNA

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 65

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<223> ZF0050310= *Arthrobacter paraffineus*

<400> 66

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<210> 67

<211> 1047

<212> DNA

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 67


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<210> 68

<211> 1047

<212> DNA

<213> unknown

<220>

<223> ZF0050310= *Arthrobacter paraffineus*

<400> 68

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